Claims

What is claimed is:

1. A device, comprising:

a waveguide core; and

a waveguide cladding in contact with said waveguide core, said waveguide cladding having a cladding refractive index that is less than a core refractive index of said waveguide core and changes in response to a control signal, wherein said waveguide core and said waveguide cladding form a waveguide to confine an electromagnetic wave.

2. The device as in claim 1, further comprising a control unit to supply said control signal and to control said electromagnetic wave by changing said cladding refractive index.

3. The device as in claim 1, wherein said waveguide core has a high refractive index from about 3.4 to about 3.6, and said waveguide cladding has a low refractive index from about 1.4 to about 2.4.

4. The device as in claim 1, further comprising a substrate fabricated with an integrated circuit which supplies said

control signal, wherein said waveguide core and said waveguide cladding are integrated on said substrate to receive said control signal.

5. The device as in claim 4, wherein said integrated circuit is a CMOS circuit, and wherein said waveguide core and said waveguide cladding are made of materials that are compatible with a CMOS fabrication process used for fabricating said CMOS circuit.

6. The device as in claim 1, wherein said waveguide core includes a semiconductor material.

7. The device as in claim 6, wherein said semiconductor material includes silicon.

8. The device as in claim 6, wherein said waveguide cladding includes an electro-optic material.

9. The device as in claim 8, wherein said electro-optic material includes a polymer.

10. The device as in claim 9, wherein said polymer is doped with chromophore.

11. The device as in claim 1, wherein said waveguide cladding includes a ferroelectric material.

12. The device as in claim 1, wherein said waveguide core is surrounded by said waveguide cladding.

13. The device as in claim 1, wherein said waveguide core and said waveguide cladding are planar layers in contact with each other.

14. The device as in claim 1, wherein said waveguide core has a strip shape and is atop said waveguide cladding.

15. The device as in claim 1, wherein said waveguide core has a strip shape that is embedded in said waveguide cladding.

16. The device as in claim 1, wherein said waveguide core and said waveguide cladding form a ridge waveguide.

17. A device, comprising:

a substrate;

a first waveguide cladding formed over said substrate;

a waveguide core formed on said first cladding and having a core refractive index greater than a first refractive index of said first cladding;

a second, adjustable waveguide cladding formed on said waveguide core and having a second refractive index that is less than said core refractive index of said waveguide core, wherein said second refractive index changes in response to an electrical control signal; and

a pair of electrodes formed over said substrate to apply said electrical control signal to said second waveguide cladding to control said second refractive index of said second waveguide cladding.

18. The device as in claim 17, wherein said substrate is a semiconductor substrate.

19. The device as in claim 18, wherein said substrate includes silicon.

20. The device as in claim 17, wherein said first waveguide cladding includes an insulating material.

21. The device as in claim 17, wherein said first waveguide cladding includes an oxide.

22. The device as in claim 17, wherein said first waveguide cladding includes a nitride.

23. The device as in claim 17, wherein said waveguide core forms a closed loop as an optical ring resonator.

24. The device as in claim 17, further comprising a plurality of pairs of electrodes along a longitudinal direction of said waveguide core in a periodic pattern operable to produce a spatial periodic index variation in said second, adjustable waveguide cladding.

25. The device as in claim 17, further comprising a second waveguide core formed between said first and said second waveguide claddings and having a core refractive index greater than the first and the second refractive indices, said second waveguide core having a waveguide portion close to a portion of

said waveguide core to effectuate evanescent coupling between said waveguide core and said second waveguide core, wherein said waveguide portion and said portion are located between said pair of electrodes.

26. The device as in claim 25, further comprising a control circuit to produce said electrical control signal and operable to control optical coupling between said waveguide core and said second waveguide core.

27. A method, comprising:

directing an optical signal into a waveguide having a high-index waveguide core and a low-index waveguide cladding, wherein said waveguide cladding exhibits an electro-optic effect; and

applying an electrical control signal to said waveguide cladding to control said optical signal via said electro-optic effect.

28. The method as in claim 27, wherein said waveguide core and said waveguide clad cladding have different refractive indices which differ by an amount from about 1 to about 2.

29. The method as in claim 27, wherein the waveguide core includes a semiconductor material.